



## Bilateral isolated cut of sensory branch of radial nerve

### Radial sinir duyuşal dalının iki taraflı izole kesisi

Nuray AKKAYA,<sup>1</sup> Hakan Ramazan ÖZCAN,<sup>2</sup> İnci GÖKALAN KARA,<sup>2</sup> Füsün ŞAHİN<sup>1</sup>

Bilateral injuries of the sensory branch of the radial nerve (SBRN) usually occur as a result of tight-handcuff neuropathy. In this case we aimed to present bilateral isolated cut of SBRN resulting an injury mechanism that has not been reported in the literature previously. A male twenty-four years old, a worker in a glass factory, presented to our clinic. The dorsolateral skin of his wrists were cut by breaking of the glass as a result of occupational accident and was primarily sutured in a healthcare center. The patient sought additional care after a month because of lingering numbness and pain, and surgery was planned. During surgery, scar tissue and neuroma at the cut ends of SBRN were excised, and bilateral SBRN cuts were repaired. Four weeks after operation, mild sensory deficit on the dorsal side of bilateral thumbs, and left first web space and flexion limitation on the right wrist were detected. At the 3rd month post-operative, right wrist joint range of motion was full, and sensory deficits, and hyperesthesia were decreased. The SBRN elicits the sensory innervation of the thumb dorsum and its injury does not cause important functional deficit. However because of susceptibility of SBRN to develop painful neuroma, diagnosis, treatment and follow up of isolated SBRN injury would be worthwhile for prevention of possible painful neuropathy disturbing quality of life.

**Key Words:** Nerve injury of forearm; neuroma; sensory branch of radial nerve.

Radial sinir duyuşal dalının (RSDD) iki taraflı yaralanmaları genellikle sıkı takılmış kelepçe nöropatisi sonucunda oluşur. Bu yazıda daha önce literatürde bildirilmemiş yaralanma mekanizması ile oluşan iki taraflı izole RSDD kesisinin sunulması amaçlandı. Yirmi dört yaşında cam fabrikasında işçi erkek hasta sunuldu. İş kazası sonucu cam kırılması ile el bilekleri dorsolateralinde oluşan cilt kesisi, başvurduğu sağlık merkezinde primer dikilmiş. Hasta 1 ay sonra geçmeyen hissizlik ve ağrı nedeniyle plastik ve rekonstrüktif cerrahi bölümüne başvurdu ve cerrahi planlandı. Cerrahi sırasında gözlenen skar doku ve RSDD kesik uçlarında oluşan nöroma temizlendi ve iki taraflı RSDD kesisi tamir edildi. Hastanın fizik tedavi ve rehabilitasyon bölümündeki fiziksel incelemesinde, iki taraflı başparmak dorsal yüzünde ve sol 1. web aralığında hafif duyuşal kayıp ve sağ el bileği fleksiyonunda kısıtlılık olduğu saptandı. Ameliyat sonrası 3. ay incelemede sağ el bileği eklem hareket açıklığı tam, duyuşal defisitler ve hiperestezi azalmıştı. RSDD başparmak dorsalinin duyuşunu sağlar, o nedenle yaralanması önemli fonksiyonel kayıba neden olmaz. Ancak, RSDD'nin ağrılı nöroma gelişimine yatkınlığı nedeniyle, izole RSDD yaralanmasının tanı, tedavi ve takibinin yapılması yaşam kalitesini bozan olası ağrılı nöropatinin önlenmesi için faydalı olacaktır.

**Anahtar Sözcükler:** Önkol sinir yaralanması; nöroma; radial sinir duyuşal dalı.

The superficial branch of the radial nerve (SBRN) is a peripheral nerve which is commonly injured along with the common peroneal and spinal accessory nerves, and can be easily repaired.<sup>[1]</sup> SBRN injury may be caused by fractures, lacerations or iatrogenic mechanisms.<sup>[2-4]</sup> It was reported that SBRN divides into 3 branches on the dorsolateral aspect of the wrist in 90% of explored cadavers. SBRN1 extends over the dor-

sal side of the index finger, SBRN2 extends over the dorsal side of the first web space and SBRN3 extends over the dorsolateral side of the thumb.<sup>[5]</sup> SBRN injury typically results in numbness, paresthesia on the dorsal side of first web space and thumb, and the formation of painful neuroma.<sup>[1]</sup> In the literature, unilateral SBRN injuries were reported due to fractures, compression of mass or iatrogenic causes<sup>[2-4]</sup> bilateral SBRN injuries

Departments of <sup>1</sup>Physical Medicine and Rehabilitation, <sup>2</sup>Plastic and Reconstructive Surgery, Pamukkale University Faculty of Medicine, Denizli, Turkey.

Pamukkale Üniversitesi Tıp Fakültesi, <sup>1</sup>Fizik Tedavi ve Rehabilitasyon Anabilim Dalı, <sup>2</sup>Plastik ve Rekonstrüktif Cerrahi Anabilim Dalı, Denizli.

Correspondence (İletişim): Nuray Akkaya, M.D. Pamukkale Üniv. Tıp Fakültesi, Fizik Tedavi ve Rehabilitasyon Anabilim Dalı, Kınıklı, 20070 Denizli, Turkey. Tel: +90 - 258 - 444 07 28 e-mail (e-posta): nrakkaya@gmail.com



**Fig. 1.** Scars on wrist anterolateral.

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were reported due to application of tight handcuffs.<sup>[6,7]</sup> In this case we aimed to present bilateral isolated cut of the SBRN by an injury mechanism that has not been reported in the literature previously. The patient has signed an informed consent form.

### CASE REPORT

A 24-year-old, male patient who was a worker in a glass factory for 10 years presented to our clinic. Skin cuts on the dorsolateral side of bilateral forearms occurred due to breaking of glass while he was carrying a large glass block. Primary suture was completed for his skin cut at a healthcare center. Patient was not wearing gloves or any other protective materials at the time of injury. The patient did not report alcohol or narcotic substances usage. The patient consulted to the Department of Plastic and Reconstructive Surgery after a month due to lingering numbness and pain on the dorsal side of bilateral thumbs and left first web space, and surgery was planned. At the time of surgery it was observed that the ends of bilateral SBRNs had been healed with scar tissue and had formed neuroma. Following excision of scar tissue and neuroma, bilateral SBRN cuts were repaired by the end-to-end epineural repair technique during surgery. After bilateral forearms were encased in a plaster-splint, the patient was referred to our Department of Physical Therapy and Rehabilitation for follow up examinations and rehabilitation.

At his physical examination, 5 cm of injury and surgery scars were seen on both the distal one third of forearms on the dorsolateral as-

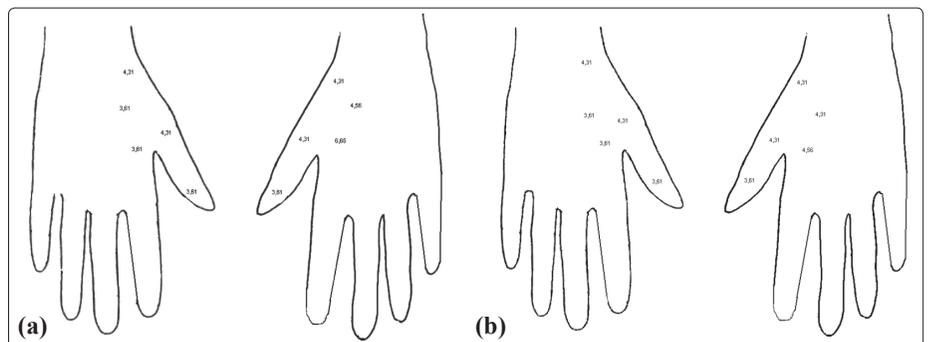
pect (Fig. 1). His bilateral wrist extension was 55°, right wrist flexion was 40°, left wrist flexion was 70°. The reason behind the limitation of right wrist flexion range of motion may be an immobilization process. For this limitation, the patient was given a physical therapy program including infrared, therapeutic ultrasound and exercises postoperatively. Mild sensory deficits were detected on the dorsal side of bilateral thumbs and the left first web space. Motor or sensory deficits in other nerves or in other fingers were not determined. When sensory deficits were evaluated with Semmes-Weinstein Monofilament test, and the dorsal side of bilateral thumbs prior to rehabilitation varied between 3.61-4.31, and the left hand first web space prior to rehabilitation varied between 4.56-6.65 (Fig. 2a). He was also taken into a desensitization program. According to the preoperative evaluation of nerve and sensory tests, it was thought that the SBRN3 was injured on the right side, and SBRN2, and SBRN3 were injured in the left side of the patient.

On his postoperative follow up at 3rd month, wrist range of motion was full and when sensory deficits were evaluated with Semmes-Weinstein Monofilament test, bilateral thumb dorsal sensory again varied between 3.61-4.31, and left first web space varied between 4.31-4.56 (Fig. 2b). Hyperesthesia was decreased but still continued.

### DISCUSSION

The radial nerve divides into deep and superficial branches after reaching the forearm. The sensory branch of radial nerve superficially lies on the radial side of the forearm. This superficial course of the nerve makes the SBRN a frequently injured nerve. Patients who are not treated may experience lifetime sensory problems depending on the degree of injury.<sup>[8]</sup>

The reported reasons for unilateral injury of SBRN are: trauma, lipoma or compression of ganglion cyst, radius fracture, damage due to Kirschner wiring of radial fracture, injury by the cannulation of peripheral vein prior to anesthesia, arthroscopy of wrist or due to De Quervain's disease.<sup>[2,4,8-10]</sup>



**Fig. 2.** (a) Semmes-Weinstein monofilament test before treatment. (b) Semmes-Weinstein monofilament test after treatment.

Bilateral radial nerve paralysis is a rare incident.<sup>[11]</sup> It has been reported that median, ulnar or multiple nerves could be damaged by tight handcuffs, however the SBRN is the most commonly injured nerve following application of tight handcuffs.<sup>[12]</sup> These SBRN injury cases often occur under the influence of alcohol or narcotic substances.<sup>[7]</sup> SBRN becomes prone to injury by compression of tight handcuffs at the distal lateral radius.<sup>[3]</sup> In this case, however, the patient had an occupational injury independent of the effects of alcohol or narcotic substances.

Nerve injuries in the upper limb are usually combined injuries with arterial or tendon damage and occur mostly at distal forearm or wrist.<sup>[13]</sup> In our patient, the injury was dorsolateral of the wrists. However in this case the injury resulted in isolated SBRN cut because of the anatomic features of the SBRN and the injury mechanism. While the SBRN lies laterally to the radial artery in the middle third of the forearm at the radial side, it is distanced from the radial artery in the lower third of forearm.<sup>[5]</sup> Although the SBRN is adjacent to the radial artery in the middle part of the forearm, in this case the injury was on the lower part of forearm, which led to isolated SBRN cut. Thus the patient may have been saved from the probable concomitant radial artery injury. Moreover, the presence of only SBRN3 cut on the right wrist, and only SBRN2 and SBRN3 cut on the left wrist were interesting, with the SBRN1 intact bilaterally. In this case, injuries occurred at approximately below the distribution of the SBRN, resulting in this type of cut in the SBRN branches.

Dellon et al.<sup>[14]</sup> reported that because of an anatomic mechanism, SBRN is more prone to develop neuroma than the palmar cutaneous branch of the median nerve and dorsal cutaneous branch of ulnar nerve. Ciaramitaro et al.<sup>[15]</sup> determined that traumatic neuropathies are usually seen in males and on upper limbs, and 72% of traumatic neuropathies were painful. In addition, a strong correlation was found between the severity of neuropathic pain and quality of life.<sup>[15]</sup> In our case, the skin cut was primarily sutured following the injury. Because of the continuation of pain and paresthesia, the patient consulted again. When the patient had the surgery for SBRN injury diagnosis, the presence of neuroma between cut ends of SBRN was observed. His pain passed and paresthesia decreased after surgery. On his postoperative follow up, it was determined that his left first web space sensory also improved.

Injury of SBRN does not cause direct negative effects to hand function because it is purely a sensory branch. However sensory deficits because of inadequate healing of the nerve following laceration of SBRN may have negative effects on hand functions,

making the hand more prone to injury. Furthermore, probable development of painful neuroma decreases the quality of life. Early diagnosis, treatment and good follow up may be effective for prevention of these complications. It should be emphasized that persons handling incisory-poignant, searing subjects, as seen in our case, must take precautions to reduce hand injuries.

In conclusion, even though peripheral sensory nerve injury does not cause motor deficits, diagnosis of SBRN cut is important because of the probable development of painful neuroma. Therefore injuries of SBRN should be diagnosed early, and properly treated to avoid negative effects of injury on quality of life.

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